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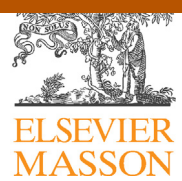

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CLINICAL RESEARCH

Prevalence and management of uncontrolled hypertension in French patients aged over 80 years

Prévalence et prise en charge de l'HTA non contrôlée chez les patients de plus de 80 ans en France

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KEYWORDS
Blood pressure;
Elderly;
Hypertension;
Quality of health care;
Pulse pressure

Summary
Background. — The rate of uncontrolled hypertensives aged >80 years is not well known. The available literature on this topic has used the threshold <140/90 mmHg, whereas there is now a consensus for a different target: systolic blood pressure (SBP) < 150 mmHg.
Aims. — This prospective observational population-based study sought to assess the frequency and management of uncontrolled hypertension in French patients aged ≥80 years.
Methods. — Nine hundred and seventy-one treated hypertensive outpatients were evaluable (204 recruited by cardiologists, 767 by general practitioners [GPs]; mean age 84.8 ± 3.8 years; 57.8% women).

Abbreviations: ABPM, Ambulatory blood pressure monitoring; CI, Confidence interval; DBP, Diastolic blood pressure; ESC, European Society of Cardiology; ESH, European Society of Hypertension; GP, General practitioner; OR, Odds ratio; SBP, Systolic blood pressure; SBPM, Self blood pressure measurement.

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Results. — The frequency of SBP ≥ 150 mmHg was 36.6% (44.6% in cardiologists' patients and 34.4% in GPs' patients). The frequency of satisfaction with SBP ≥ 150 mmHg was 22.0% for cardiologists (32.6% if diastolic blood pressure [DBP] < 90 mmHg and 9.5% if ≥90 mmHg; $P = 0.008$) and 30.4% for GPs (51.7% if DBP < 90 mmHg and 13.2% if ≥90 mmHg; $P < 0.0001$). Non-diabetic status (for cardiologists) and DBP < 90 mmHg (for cardiologists and GPs) were independent determinants of SBP being considered acceptable. Accordingly, in patients with an SBP level ≥ 150 mmHg that was considered too high, treatment was reinforced more often if DBP was ≥90 mmHg (82.3%) than <90 mmHg (68.5%).
Conclusion. — In France, hypertension is uncontrolled in more than one in three elderly hypertensives. Physicians are aware that SBP should be lowered to < 150 mmHg in patients aged > 80 years, but when the target is not reached they are less likely to increase treatment if DBP is < 90 mmHg.

MOTS CLÉS
Pression artérielle ;
Sujets âgés ;
Hypertension ;
Qualité de prise en charge ;
Pression pulsée

Résumé
Contexte. — La prévalence de l'hypertension artérielle (HTA) non contrôlée chez les sujets de 80 ans ou plus est mal connue. La littérature disponible sur ce thème a utilisé le seuil PA < 140/90 mmHg, alors qu'il y a maintenant un consensus pour une cible différente: PAS < 150 mmHg.
Objectifs. — Cette étude observationnelle a pour objectif d'évaluer la prévalence et la prise en charge de l'HTA non contrôlée des sujets d'âge ≥ 80 ans.
Méthodes. — Neuf cent soixante et onze patients suivis en consultation pour une HTA traitée ont été évalués (204 par des cardiologues, 767 par des médecins généralistes (MG) ; âge moyen 84,8 ± 3,8 ans ; 57,8 % de femmes).
Résultats. — La prévalence d'une PAS ≥ 150 mmHg était de 44,6 % chez les cardiologues et 34,4 % en médecine générale. Le taux de satisfaction avec une PAS ≥ 150 mmHg était de 30,4 % pour les MG et 22,0 % pour les cardiologues. L'absence de diabète (pour les cardiologues) et une PAD ≤ 90 mmHg (pour cardiologues et MG) étaient les déterminants indépendants d'une PAS considérée comme acceptable. En conséquence, face à une PAS ≥ 150 mmHg et considérée comme trop élevée, le traitement était plus souvent renforcé quand la PAD était ≥ 90 mmHg (82,3 %) que lorsqu'elle était < 90 mmHg (68,5 %).
Conclusions. — En France, plus d'un hypertendu âgé sur 3 n'est pas contrôlé. Les médecins savent que la PAS doit être abaissée en-dessous de 150 mmHg chez les plus de 80 ans, mais quand la cible n'est pas atteinte, ils sont malheureusement moins enclins à renforcer le traitement si la PAD est inférieure à 90 mmHg.

Background

There is a large body of epidemiological data concerning the prevalence of hypertension and its rate of control in populations aged < 75 years [1—4], but little is known about these aspects in patients aged > 80 years. One recent survey estimated the prevalence of hypertension among French subjects aged ≥ 80 years at 70% (69.7% in women, 70.4% in men) [5]. The HYVET study showed that a drug-induced decrease in blood pressure (BP) by 17/6 mmHg with respect to placebo was associated with a significant decrease in cardiovascular morbidity and mortality [6].

However, the overall efficacy of antihypertensive therapy depends on the extent to which blood pressure is lowered and the frequency with which hypertension is controlled. In subjects aged between 18 and 75 years, a recent French survey (ENNS 2006—2007) reported the rate of blood pressure control to be 50.9%, with a clear difference between women (58.5%) and men (41.8%), and as a function of age (64% in women and 46.8% in men aged between 45 and 54 years versus 49.6% in women and 33.9% in men aged between 65 and 74 years) [7].

In hypertensives aged > 80 years, the 2005 and 2013 French recommendations, as well as 2013 European guidelines, recommended that systolic blood pressure (SBP) be reduced to < 150 mmHg [8—10], while the 2007 European Society of Hypertension (ESH)/European Society of Cardiology (ESC) guidelines aimed at an SBP level < 140 mmHg [11]. Despite its considerable socioeconomic importance, the specific issue of blood pressure control in patients aged ≥ 80 years has rarely been addressed. We therefore decided to carry out this observational study, to investigate both the frequency of patients aged > 80 years with uncontrolled blood pressure and the management of these patients in current clinical practice.

Methods

This nationwide survey was carried out between December 2007 and May 2008. The investigators were selected at random from a list of about 15000 general practitioners (GPs) and 1500 cardiologists throughout France.

Each investigator was asked to include four consecutive hypertensive patients aged ≥80 years and taking antihypertensive medication at the time of consultation. All the patients included had to have been known to their GP or cardiologist for several months. There were no specific exclusion criteria, but the doctors had to include outpatients who were able to come to surgery and to answer their questions correctly. Each physician was asked to complete a questionnaire that included the following information (obtained from the patient's medical file, direct examination and medical interview): demographic characteristics; family history of cardiovascular diseases; smoking status; hypercholesterolaemia; diabetes mellitus; target organ damage (left ventricular hypertrophy and/or microalbuminuria); established cardiovascular disease; renal disease (creatinine clearance <60 mL/min according to Cockcroft's formula or proteinuria > 500 mg/day); duration of hypertension; current clinical blood pressure; and current antihypertensive drug use. Blood pressure was measured at a single visit, in the sitting position, by the physician, with his/her usual sphygmomanometer. Measurements had to be done according to the World Health Organization recommendations (i.e. three consecutive readings after a 5-minute rest time).

At the end of the questionnaire, physicians gave their opinion about the patient's blood pressure control by ticking a box to select one of the following two propositions: 'blood pressure too high and should be lowered' or 'blood pressure acceptable'. Physicians were then asked to report their decisions at the end of the consultation: prescription of self blood pressure measurement (SBPM) or ambulatory blood pressure monitoring (ABPM); intensification of lifestyle changes; requesting the advice of another specialist; change to current antihypertensive treatment; or no change in treatment. In cases of treatment modification, the doctor was asked to indicate whether they had added a drug to the existing regimen, replaced one or more drugs by other drugs and/or increased the dose of one or several drugs.

Patients were informed orally, signed an informed consent form and their identities were kept secret, in accordance with French law. An 'institutional board' supervised the study.

Data analysis

As differences in blood pressure and cardiovascular risk were expected between GPs' and cardiologists' patients, all analyses were stratified according to the physician status. The prevalence of uncontrolled hypertension was calculated according to the available guidelines: percentage of patients with SBP ≥ 150 mmHg [8—10]. Assuming a prevalence of uncontrolled hypertension of about 50% and a precision of the 95% confidence interval (CI) of 3%, a sample size of about 1000 patients was required for this study. For descriptive analyses, means ± standard deviations are reported for continuous variables and absolute numbers and percentages are reported for categorical variables. The factors associated with high blood pressure and with the physician's interpretation of blood pressure results were identified by univariate analysis (Student's *t* test for quantitative variables and chi-square test for qualitative variables) and by multivariable analysis with a logistic regression analysis performed using a manual backward procedure. All the variables associated with the dependent variable in univariate analysis, with a *P* value < 0.20, were considered in the maximal model of the multivariable analysis. Best-fit models obtained after applying backward procedure contain only the variables showing an adjusted *P* value < 0.05. Analyses were carried out with SAS version 9.2 software (SAS Institute, Cary, NC, USA).

Results

In total, 248 physicians participated in this study; they enrolled 1119 patients, 971 of whom could be evaluated (204 recruited by cardiologists and 767 recruited by GPs). The main characteristics of the patients are presented, as a function of physician status, in Table 1. The most frequently reported risk factor associated with hypertension was dyslipidaemia, followed by diabetes mellitus and obesity. Active tobacco consumption was quite low. The cardiology patients (C group) had a much higher prevalence of target organ damage than the patients consulting GPs (GP group).

Current antihypertensive treatment

Patients were taking a mean of two classes of antihypertensive drugs (Table 2). The mean number of classes of drug used was higher in the C group than in GP group: 2.43 ± 0.97 and 1.98 ± 0.92, respectively. Moreover, 44.4% of the patients in the C group were given drugs from three or more classes, versus only 26.7% in the GP group. Diuretics were the most frequently prescribed antihypertensive agents (66% in the C group, 54% in the GP group) followed by angiotensin-converting enzyme inhibitors (47% and 37%, respectively). Calcium channel blockers were the third most frequently prescribed class of drugs in the C group (42%) and the fourth most frequently prescribed class of drugs in the GP group (29%). Diuretics were absent from the drugs prescribed to 10.9% of the patients (32/294) taking drugs from three or more different classes (10/90 in the C group and 22/204 in the GP group).

Blood pressure levels and prevalence of uncontrolled hypertension

Mean SBP was about 5 mmHg higher in the C group than in the GP group, whereas the difference between the two groups was < 1 mmHg for diastolic blood pressure (DBP) (Table 3). No differences in mean SBP or DBP were found between men and women.

The prevalence of uncontrolled hypertension was 36.6% (95% CI 37.8—51.4) in the overall population: 44.6% (95% CI 37.8—51.4) in the C group (men 43.0%; women 46.1%) and 34.4% (95% CI 31.0—37.8) in the GP group (men 36.4%;

Table 1 Demographic and clinical characteristics: risk factors among patients seen by cardiologists or general practitioners.

Patient characteristics	C group ($n = 204$)	GP group ($n = 767$)	Total ($n = 971$)
Age (years)	84.0 ± 3.2	85.0 ± 3.9[a]	84.8 ± 3.8
Age group			
<85 years	134 (66)	400 (42)	534 (55)
85–89 years	57 (28)	275 (36)	332 (34)
≥90 years	13 (6)	91 (12)	104 (11)
Female sex	117 (57.6)	437 (57.8)	554 (57.8)
Hypertension duration > 1 year	199 (97.5)	737 (97.1)	936 (97.2)
BMI (kg/m^2)	26.89 ± 3.92	26.35 ± 4.47	26.47 ± 4.36
Obesity (BMI ≥30 kg/m^2)	42 (20.9)	135 (18.0)	177 (18.7)
Current smoker	13 (6.4)	53 (6.9)	66 (6.8)
Family history of premature CVD (men at age <55 years; women at age <65 years)	26 (12.7)	96 (12.5)	122 (12.6)
Dyslipidaemia (LDL-C ≥ 1.60 g/L and/or HDL-C ≤ 0.40 g/L or treatment)	97 (47.5)	404 (52.7)	501 (51.6)
Diabetes mellitus	57 (27.9)	175 (22.8)	232 (23.9)
Target organ damage (LVH or abnormal albuminuria)	84 (41.2)	154 (20.1)[b]	238 (24.5)
Established CVD (angina, myocardial infarction, stroke, peripheral artery disease)	91 (44.6)	311 (40.5)	402 (41.4)
Renal disease (creatinine clearance < 60 mL/min or proteinuria > 500 mg/day)	37 (18.1)	109 (14.2)	146 (15.0)

Data are mean ± standard deviation or number (%). BMI: body mass index; C group: cardiologists' patients; CVD: cardiovascular disease; GP group: general practitioners' patients; HDL-C: high-density lipoprotein cholesterol; LDL-C: low-density lipoprotein cholesterol; LVH: left ventricular hypertrophy.
[a] $P = 0.05$.
[b] $P < 0.001$.

women 32.7%). Among these patients with SPB ≥ 150 mmHg, 47% had a DBP < 90 mmHg (54% and 45% in C and GP groups, respectively) and received a more intensive treatment (Table 4). None of the following factors was significantly associated with poor control: age; duration of arterial hypertension; body mass index; various cardiovascular risk factors; diabetes; target organ damage; cardiovascular or renal diseases. Using the 2007 ESH/ESC cut-off point of 140/90 mmHg, the prevalence of uncontrolled hypertension reached 74.0% in the C group (95% CI 68.0–80.0) and 64.4% in the GP group (95% CI 61.0–67.8).

Opinion of the physicians concerning blood pressure control

The physicians indicated their opinion of the blood pressure figures obtained for 963 patients (203 in the C group and 760 in the GP group). Current blood pressure figures were considered too high for 42.4% of the C group (86/203) and for 27.0% of the GP group (205/760).

We compared the doctors' interpretation of the blood pressure figures with the objectives defined by 2005–2013 French/2013 European guidelines for the very elderly (Fig. 1). Concordance (SBP < 150 mmHg and level considered acceptable or SBP ≥ 150 mmHg and level considered too high) was found for > 80% of the patients in both the C and GP groups. Most of the discrepancies in the GP group (79/103, 76.7%) corresponded to patients whose blood pressure was considered acceptable despite SBP ≥ 150 mmHg. Such patients accounted for only 57.1% of discrepancies (20/35) in the C group. Accordingly, the rate of satisfaction with SBP ≥ 150 mmHg was 22.0% in the C group (20/91) and 30.4% in the GP group (79/260). Considering separately the patients with SBP ≥ 150 mmHg and DBP < 90 mmHg, and those with SBP ≥ 150 mmHg and DBP ≥ 90 mmHg, the rate of satisfaction was significantly higher in the former group ($n = 16/49$, 32.6% in the C group and $n = 60/116$, 51.7% in the GP group) than in the latter ($n = 4/42$, 9.5%, $P = 0.008$ in the C group and $n = 19/144$, 13.2%, $P < 0.0001$ in the GP group; Table 4).

Multivariable analysis showed that, after adjustment for SBP level (SBP ≥ 150 versus < 150 mmHg), cardiologists were more likely to consider blood pressure to be acceptable (acceptable blood pressure versus too high and in need of

Table 2 Current antihypertensive treatments among patients seen by cardiologists or general practitioners.

	C group ($n = 203$[a])	GP group ($n = 766$[a])	Total ($n = 969$)
Number of treatments			
Single agent	33 (16.3)	270 (35.2)	303 (31.3)
Two-drug combination	80 (39.4)	292 (38.1)	372 (38.4)
Three-drug combination	65 (32.0)	156 (20.4)	221 (22.8)
Combination of four or more drugs	25 (12.4)	48 (6.3)	73 (7.5)
Antihypertensive drug classes			
Diuretics	134 (66.0)	414 (54.0)	548 (56.5)
ACE inhibitors	96 (47.3)	285 (37.2)	381 (39.3)
ARBs	65 (32.0)	275 (35.9)	340 (35.1)
CCBs	85 (41.9)	222 (29.0)	307 (31.7)
Beta-blockers	82 (40.4)	217 (28.3)	299 (30.9)
Alpha-blockers	10 (4.9)	48 (6.3)	58 (6.0)
Other antihypertensive drug classes	22 (10.8)	58 (7.6)	80 (8.3)
Description of single agents ($n = 303$)			
ACE inhibitors	6 (18.2)	67 (24.8)	73 (24.1)
ARBs	3 (9.1)	71 (26.3)	74 (24.4)
Diuretics	12 (36.4)	52 (19.3)	64 (21.1)
CCBs	6 (18.2)	41 (15.2)	47 (15.5)
Beta-blockers	3 (9.1)	26 (9.6)	29 (9.6)
Others	3 (9.1)	13 (4.8)	16 (5.3)
Description of two-drug combinations ($n = 372$)			
ACE inhibitors + diuretics	22 (27.5)	70 (24.0)	92 (24.7)
ARBs + diuretics	10 (12.5)	62 (21.2)	72 (19.3)
ACE inhibitors + beta-blockers	6 (7.5)	21 (7.2)	27 (7.3)
Beta-blockers + diuretics	7 (8.7)	17 (5.8)	24 (6.5)
ACE inhibitors + CCBs	11 (13.7)	21 (7.2)	32 (8.6)
ARBs + CCBs	5 (6.2)	19 (6.5)	24 (6.5)
CCBs + diuretics	2 (2.5)	22 (7.5)	24 (6.5)
Others	63 (12.2)	60 (20.5)	123 (33.1)
Description of three-drug combinations ($n = 221$)			
Beta-blockers + ACE inhibitors + diuretics	18 (27.7)	32 (20.5)	50 (22.6)
ARBs + diuretics + CCBs	10 (15.4)	27 (17.3)	37 (16.7)
ARBs + diuretics + beta-blockers	7 (10.8)	21 (13.5)	28 (12.7)
ACE inhibitors + diuretics + CCBs	9 (13.8)	18 (11.5)	27 (12.2)
Others	21 (32.3)	58 (37.2)	79 (35.7)

Data are number (%). ACE: angiotensin-converting enzyme; ARB: angiotensin receptor blocker; C group: cardiologists' patients; CCB: calcium channel blocker; GP group: general practitioners' patients.
[a] One patient with missing values in both groups.

lowering [referent]) in non-diabetic patients (i.e. no diabetes versus diabetes [referent]: odds ratio [OR] 2.68, 95% CI 1.10—6.53; $P = 0.03$) and in patients with lower DBP (i.e. DBP < 90 mmHg versus ≥ 90 mmHg [referent]: OR 9.80, 95% CI 3.56—27.03; $P = < 0.0001$).

GPs more frequently considered blood pressure as acceptable in older patients (i.e. ≥ 85 years versus < 85 years [referent]: OR 2.39, 95% CI 1.42—4.02; $P = 0.001$), in patients with hypertension of longer duration (i.e. ≥1 year versus < 1 year [referent]: OR 6.29, 95% CI 1.81—22.22; $p = 0.004$) and in patients with lower DBP (i.e. DBP < 90 mmHg versus ≥90 mmHg [referent]: OR 9.09, 95% CI 5.38—15.38; $P = <0.0001$).

Management of patients

Information about patient management was available for 98.8% of the C group and 98.0% of the GP group (Table 5). Treatment was changed in 78.8% of the C group and in 77.1% of the GP group, because the doctor felt that their blood pressure was too high and needed to be lowered. The most frequent change was the addition of a drug to the regimen, in both groups. However, the addition of a drug was less frequent in patients already taking ≥ 3 drugs than in patients taking ≤2 drugs: 45.2% (14/31) vs 72.6% (90/124) in the GP group and 48.1% (13/27) vs 67.5% (27/40) in the C group. Lifestyle changes were more frequently intensified by GPs

Table 3 Blood pressure data among patients seen by cardiologists or general practitioners.

	C group	GP group	Total
	($n = 204$)	($n = 767$)	($n = 971$)
Systolic blood pressure (mmHg)	148.5 ± 18.8	143.4 ± 15.4[a]	144.5 ± 16.3
Diastolic blood pressure (mmHg)	81.0 ± 10.1	81.8 ± 9.4	81.7 ± 9.5
Blood pressure levels			
SBP < 150 and DBP < 90 mmHg	103 (50.5)	456 (59.4)	559 (57.6)
SBP ≥ 150 and DBP ≥ 90 mmHg	42 (20.6)	145 (18.9)	187 (19.3)
SBP ≥ 150 and DBP < 90 mmHg	49 (24.0)	119 (15.5)	168 (17.3)
SBP < 150 and DBP ≥ 90 mmHg	10 (4.9)	47 (6.1)	57 (5.9)

Data are mean ± standard deviation or number (%). C group: cardiologists' patients; DBP: diastolic blood pressure; GP group: general practitioners; patients; SBP: systolic blood pressure.
[a] $P < 0.005$.

Table 4 Characteristics of patients with systolic blood pressure ≥150 mmHg according to diastolic blood pressure level.

Patient characteristics	DBP < 90 mmHg	DBP ≥ 90 mmHg	*P*
	($n = 168$)	($n = 187$)	
Age (years)	84.4 ± 3.6	84.4 ± 3.6	0.99
Female sex	87 (52.7)	110 (59.5)	0.20
SBP (mmHg)	158.8 ± 10.6	163.6 ± 14.2	0.004
DBP (mmHg)	79.6 ± 6.2	94.7 ± 5.7	<0.0001
Mean number of treatments	2.24 (0.99)	1.94 (0.88)	0.006
Distribution of treatments			0.02
Single agent	43 (25.6)	65 (34.9)	
Two-drug combination	62 (36.9)	78 (41.9)	
Three-drug combination	46 (27.4)	33 (17.7)	
Combination of four or more drugs	17 (10.1)	10 (5.4)	
Blood pressure figures considered as acceptable	76/165 (46.1)	23/186 (12.4)	<0.0001
Treatment reinforcement	63/92 (68.5)	135/163 (82.3)	0.01

Data are mean ± standard deviation or number (%). BMI: body mass index; CVD: cardiovascular disease; DBP: diastolic blood pressure; GP: general practitioner; HDL-C: high-density lipoprotein cholesterol; LDL-C: low-density lipoprotein cholesterol; LVH: left ventricular hypertrophy; SBP: systolic blood pressure.

Table 5 Management of patients with a blood pressure level that is considered too high by the physician.

	C group	GP group	Total
	($n = 85$)	($n = 201$)	($n = 286$)
Medication change	67 (78.8)	155 (77.1)	222 (77.6)
Drug addition	40 (59.7)	104 (67.1)	144 (64.9)
Drug switching	19 (28.4)	24 (15.5)	43 (19.4)
Increase in dose	18 (26.9)	36 (23.2)	54 (24.3)
Strengthening of lifestyle recommendations	39 (45.9)	115 (57.2)	154 (53.8)
Associated with a change in medication	29 (74.3)	83 (72.2)	112 (72.7)
Home blood pressure measurements	23 (27.1)	55 (27.4)	78 (27.3)
Associated with a change in medication	15 (65.2)	40 (72.7)	55 (70.5)
Ambulatory blood pressure measurements	17 (20.0)	14 (7.0)	31 (10.8)
Associated with a change in medication	13 (76.5)	6 (42.8)	19 (61.3)
Specialist advice sought	2 (2.3)	30 (14.9)	32 (11.1)

Data are number (%). C group: cardiologists' patients; GP group: general practitioners' patients.

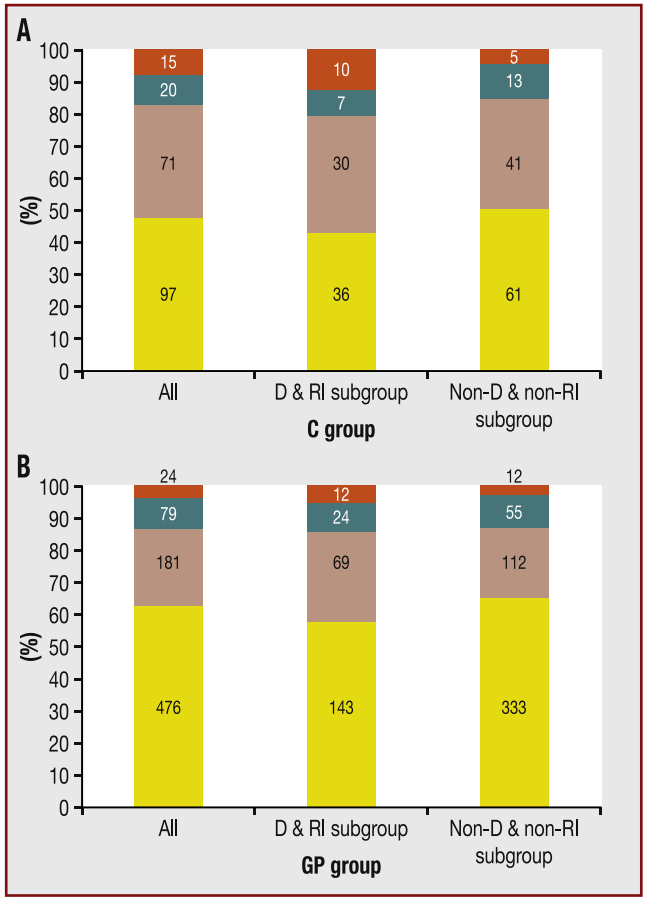

Figure 1. Assessment of blood pressure (BP) figures by the doctors, taking into account the objective defined by systolic BP < 150 mmHg. C: cardiologist; D: diabetes; GP: general practitioner; RI: renal disease. Orange colour: BP controlled but considered too high; blue colour: BP uncontrolled but considered acceptable; brown colour: BP uncontrolled and considered too high; yellow colour: BP controlled and considered acceptable.

than by cardiologists (57.2% vs 45.9%) and were associated with treatment changes in >70% of cases. SBPM was prescribed to >25% of all patients in both groups, whereas ABPM was more frequently prescribed by cardiologists than by GPs (20% vs 7%). GPs requested specialist advice for only 14.9% of their patients, increasing to 30% (15/50) for patients taking ≥3 drugs.

As shown in Table 4, among patients with an SBP level ≥150 mmHg and considered to be too high, treatment was more often increased when DBP was ≥ 90 mmHg (135/163, 82.3%) than when DBP was < 90 mmHg (63/92. 68.5%; adjusted OR 2.08, 95% CI 1.18—3.57; $P = 0.01$), as well as when the number of antihypertensive drugs was at least three (adjusted OR 2.00, 95% CI 1.12—3.57).

Discussion

Little is known about blood pressure control and arterial hypertension management in patients aged ≥80 years in France. The most recent French surveys have been population-based studies, including undiagnosed and untreated hypertensive patients aged <75 years [7,12—14]. Differences in the level of hypertension control have been highlighted between Europe and North America, with lower rates in European countries than in the USA [15—17]. However, data about very elderly are sparse. The National Health and Nutrition Examination Survey showed failure rates of 69.5% in men and 77.8% in women [18]. A primary care Spanish study reported that 64.4% of patients had a blood pressure level > 140/90 mmHg. Thus, these figures are close to those we found using this threshold (74.0% in the C group and 64.6% in the GP group) [19].

The issue of the blood pressure level to be reached in the very elderly is of crucial importance. In 2005, experts of the French 'Haute Autorité de santé' suggested that doctors should not try to lower SBP beyond 150 mmHg in patients aged ≥ 80 years, and that no more than three different drugs should be given to such patients [8]. On the contrary, the general recommendations for Europe published in 2007 maintained a target blood pressure of 140/90 mmHg for the entire hypertensive population, regardless of age [11]. The debate remained open until the results of HYVET study, which randomly allocated 3845 patients with an entry SBP level ≥160 mmHg and a target SBP level <150 mmHg. Blood pressure decreased to 144/78 mmHg in treated patients versus 161/84 mmHg in the placebo group, and this additional decrease in blood pressure was associated with a 30% decrease in stroke ($P = 0.055$) and statistically significant decreases in congestive heart failure (64%), major cardiovascular events (34%) and all-cause death (21%). Therefore, the 2009 reappraisal of European guidelines clearly recommended prescribing antihypertensive treatment to patients aged >80 years with SBP > 160 mmHg, with the aim of lowering blood pressure to <150 mmHg [20]. This recommendation was approved by both the new 2013 ESH guidelines [10] and the 2013 French recommendations [9].

Our study showed that the high prevalence of uncontrolled blood pressure was not due to poor knowledge of current recommendations or to physicians' willingness to accept high systolic blood pressure values, as >80% of patients were correctly classified as having acceptable or unacceptable blood pressure based on the threshold of an SBP level of 150 mmHg. Redon et al. reported a consistent overestimation of the number of controlled patients: in their paper, the real blood pressure control rate was 46% in France, contrasting with a perception of normalized blood pressure in 84% of patients [21].

Diabetes was found to be an independent determinant factor for blood pressure being considered unsatisfactory among cardiologists (OR 2.68), but not among GPs, indicating that cardiologists were aware of the need to reduce blood pressure to slightly lower levels in diabetic patients. Interestingly, a DBP level < 90 mmHg appeared to be linked, for both cardiologists and GPs, to a higher rate of satisfaction, resulting in a lower frequency of treatment increase: these data suggest that the high prognostic value of pulse pressure is not taken into account by physicians in the management of their elderly hypertensives (or is poorly known about).

Eventually, in more than one fifth of patients in our survey with a blood pressure that was considered too high, neither cardiologists nor GPs decided to change the treatment. Such an attitude has been widely reported in previous studies and is described as 'therapeutic inertia', restricted

to physicians who have knowledge of the guidelines but do not apply them [22]. In primary care settings, antihypertensive medication remains unchanged in more than 60% of patients who do not achieve blood pressure targets [23,24]. In patients aged >80 years, doctors may be reluctant to increase medication due to poor knowledge of pulse pressure significance, as indicated above, but also due to a fear of adverse reactions to drugs. In one retrospective cohort study of patients referred to a hypertension clinic, the incidence of documented adverse drug reactions reached 40% [25]. In addition, a recent review showed that antihypertensive treatment increased the risk of severe falls by 2.4 [26]. By contrast, in community-dwelling elderly patients, hypertension control, with or without orthostatic hypotension, was not associated with a higher risk of falls [27]. In our survey, some physicians decided to add a new drug to the treatment regimen of patients already taking a three-drug combination (48.1% in the C group and 45.2% in the GP group), despite recommendations to treat patients aged >80 years with no more than three drugs. The proportion of patients treated with three or more antihypertensive drugs was higher in our survey than in the population from the USA [18]: 20% vs 44% in the C group and 26% in the GP group in our study.

The new 2013 ESH guidelines [10] stressed that 'in frail elderly patients, it is recommended to leave decisions on antihypertensive therapy to the treating physician, and based on monitoring of the clinical effects of treatment': this recommendation is in agreement with the findings of some outcome-based studies, namely the JATOS study, which showed no difference regarding total deaths between the strict-treatment group and the mild-treatment group [28]. Blood pressure control could also be improved by the use of SBPM: a meta-analysis conducted by Bray et al. has shown SBP/DBP figures to be 4.82/1.45 mmHg lower in patients enrolled in trials with SBPM than in trials without SBPM [29]. On the other hand, ABPM is well tolerated in the very elderly and would prevent an inappropriate escalation of drug treatment in those with a marked white-coat effect [25]. The American College of Cardiology Foundation/American Heart Association consensus on hypertension in the elderly recommends these ambulatory measurements [30].

Study limitations

Our study has a number of limitations. First, it was a visit-based rather than a population-based survey: patients were able to visit the surgery and to answer doctors' questions, so our findings should not be extrapolated to octogenarians with severe physical and/or cognitive alteration nor to octogenarian inpatients [31]. Second, the prevalence of uncontrolled hypertension may have been overestimated because blood pressure was measured at a single visit. Third, as the aim of this survey was to investigate blood pressure control under conditions of daily clinical practice, the blood pressure device was not standardized; however this is a current methodological choice in this kind of survey [19].

Conclusions

In conclusion, the frequency of uncontrolled hypertension (defined as SBP $\geq$ 150 mmHg) in hypertensive outpatients aged $\geq$80 years was found to be as high as 37% in France. A concordance between the blood pressure values and the doctor's interpretation of those values was observed in 80% of the patients. Doctors were satisfied with SBP $\geq$ 150 mmHg in one in four patients. The treatment was changed in about 80% of the patients considered to have an unsatisfactory blood pressure, whereas it was modified in about 60% of those with SBP > 150 mmHg, regardless of the doctor's interpretation. Diabetes was an independent determinant of blood pressure being considered unsatisfactory. Our findings suggest that French physicians are aware that SBP should be lowered to <150 mmHg in the elderly but, unfortunately, are less likely to increase treatment in uncontrolled patients with a DBP < 90 mmHg.

Disclosure of interest

The authors declare that they have no conflicts of interest concerning this article.

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